Remarks

Claims 1 to 20 remain the application.

The specification at paragraph 43 is amended to correct to a minor typographical error.

The label "Verizon CDPD network connectivity" in Figures 1 and 2 and the label "Verizon CDMA connectivity" in Figures 3 and 4 refer to the experimental test conditions. As described in paragraphs 33 and 34 of the specification, "A ICMP-based probe with packet size 64 bytes polled www.yahoo.com continuously **via service provider** CDPD and CDMA 1*x*RTT networks respectively, and the round-trip time (RTT) of each probe was measured. Fig. 1 and Fig. 3 show results obtained from 45-minute drive time during rush hour. Fig. 2 and Fig.4 show the results obtained from fixed-location test." The labels in Figs. 1 - 4 describe the test conditions where Verizon was the service provider. Hence, the figures are not "prior art" and should not be labeled as such. In addition, it is respectfully submitted that corrected drawings are not required and Figs. 1 - 4 should not be objected to.

Claim 20 has been amended to obviate the Examiner's objection to the lack of an antecedent basis for "begin at the point that file loading was stopped". The language is amended to read "begin where file loading was stopped". The amended language is more consistent with the language found, for example, in paragraph 43 of the specification.

The claimed invention has two primary aspects. First, a carrier-independent framework allows HTTP ongoing sessions to be switched from a lower-bandwidth network to a higher-bandwidth network on the fly (network environment awareness and network adaptation). Second, a shield ensures the continuity of HTTP sessions during network switch without human involvement (transparent failure recovery). This means that files which are being downloaded during network handoff and are stopped, can be resumed where the downloading was stopped, without the need to download from the beginning of the material. The invention is very useful in a failure-prone vehicular heterogeneous network environment.

The major difference between the claimed invention and the techniques described in the cited references is that in the claimed invention, network handoffs are initiated by the mobile host (client), while network handoff/handover techniques in the cited references are initiated by the network carrier (operators). The client-initiated network handoff, for example, a preemptive handoff, is independent of network carriers. In the present invention, detection of a change of network environment, as well as selection of a network interface is performed by the mobile host, makes the method more scalable, and more flexible in selecting network carriers, and also supports cross-operator network handoff.

In contrast, the network-initiated handoff described in the cited references is restricted to single network carrier environment, such as a cellular and local wireless networks managed by a single network carrier. The claimed method and the methods described in the cited references by their nature represent two distinct categories: the claimed invention is a network agnostic approach (independent of network operators) and the cited references describe network dependent approaches.

It is worth mentioning that in addition to heterogeneous network handoff and cross-operator network handoff, the claimed method also takes failure recovery into account, thereby supporting transparent failure recovery. As will be described in detail below, these distinct features make the claimed method significantly different from the methods described in the cited references.

Claims 8 and 10 stand rejected under 35 USC 102(e) as being anticipated by Gao et al (Gao) (US2004/0067754 A1).

In amended Claim 8 a step of determining that the user device is in an area of overlap is performed by the user device. In contrast, in Gao the handoff is made in accordance with rules established by a hyper operator [page 2, para. 0019]. Page 3, para. 0027 reads "Vertical handover also may occur due to the limitations on access network coverage. Users change access systems when at the edge of a coverage area of an access

network. When the user is located in the overlay area 226, the user can switch to another access network using vertical handover. If the user is not located in the overlay area 226, the user could lose the connection. When disconnection occurs, the session is either reset or software may attempt to compensate in other ways, such as using different coding schemes to recover the losses from packets already received." That is, Gao contemplates a transfer even when the user device is not in an overlap area. The statement at page 4 of the Office Action that "the fact that the mobile device is in that [overlapping] area must have been determined before the handover takes place" is not clear from Gao since Gao contemplates handover in a non-overlapping area with consequent loss of the connection.

Claim 10 is dependent upon Claim 8 and claims that the second network operates at a higher bandwidth than the first network. The detection of the higher bandwidth is significant since it allows for a preemptive handoff (page 8, para. 31 of the specification). The present invention carries out a preemptive handoff having the ability to automatically relinquish a lower-bandwidth connection and reestablish a higher-bandwidth connection in the presence of multiple networks. This preemptive handoff should not be confused with a vertical or horizontal handoff as the objective is entirely different. The goal of horizontal or vertical handoff is to ensure network connectivity in mobile environments, while the goal of preemptive handoff, according to the present invention is to optimize system performance. The preemptive handoff of the present invention is implemented at the application layer rather than the network or link layer and has the main goal of

overcoming network hysteresis in heterogeneous environments, with the objective of fully utilizing the available resources and maximizing system performance.

Gao describes supporting quality of service (QoS) with vertical handoffs and mentions that high-bandwidth handovers are possible. Gao fails to teach or suggest a method of handing off a user device from a first network to second network including the steps of determining by the user device that the user device is in an area where the networks overlap and where the second network operates at a higher bandwidth than the first network as claimed in claim 10.

Therefore, it is respectfully submitted that Claims 8 and 10 should be deemed allowable over Gao.

Claims 1 and 3 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Gao in view of Wu (US2002/0082015 A1).

The transcoding proxy server in Wu converts various types of contents into formats that are acceptable for a specific mobile device. This transcoding process typically involves actions such as adjusting the presentation so it will fit on the small screen on the mobile device, removing unnecessary elements such as audio for devices that have no sound capabilities, scaling graphics to an appropriate size, compressing data

for transmission to the mobile device, converting from e.g. HTML to WML, and so on. See, page 1, para. 0004.

Claim 1 claims a proxy comprising "means for determining that said user device is in an area of overlap by different networks within said environment; and means for handing off said user device from a first network to a second network." Claim 3 is dependent upon Claim 1 and claims "wherein said second network operates at a higher bandwidth than said first network."

Gao fails to teach within its four corners a proxy comprising "means for determining that said user device is in an area of overlap by different networks within said environment" as claimed in Claim 1. Wu likewise fails to teach or even suggest such a proxy comprising "means for determining" as claimed by Applicants.

While Wu describes that the mobile device 104 is in a good position to determine when to perform a handover (page 2, para. 0011), the proxies 111, 112 transcode communication sessions in their associated service areas 101, 102 to and from a format suitable for the mobile device 104, to facilitate access to the content offered by the content servers 106,107. The transcoding proxies 111, 112 convert various types of contents into formats that are acceptable for the mobile device 104. [Page 3, para. 0029]

The "proxy" described in Wu merely converts content formats and does not comprise "means for determining" or the "means for handing off" as claimed by Applicants. As discussed with regard to Claim 1 above, Gao and Wu, both singly or in combination, fail to teach or suggest a proxy comprising means for handing off a user device from a first network to a second network wherein the second network operates at a higher bandwidth than the first network as claimed in Claim 3.

Therefore, it is respectfully submitted that Claims 1 and 3 should be deemed allowable over Gao in view of Wu.

Claims 14, 15 and 17 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Gao in view of Wu and Labun et al (Labun) (US 6,842,621)

Claim 14 is amended to clarify that there is a client side proxy and a server side IGW. In order to achieve the goal of web access transparency, the system architecture of the present invention provides a multi-tiered architecture that transparently interposes itself between a web browser and a web server. The architecture includes a client-side proxy and a server side information gateway (IGW) interposed between the web browser and web server. The addition of the client-side proxy and the server side IGW provides a shield that ensures HTTP session continuity without requiring modification of the existing web server and web browser. This enhances overall system robustness and helps

reduce HTTP session disruption caused by transient network disconnects. (See, page 9, para. 35.)

Wu is cited by the Examiner for teaching a proxy interposed between a web browser and a web server and an information gateway interposed between the proxy and the web server. As amended, Claim 14 claims an architecture comprising a proxy interposed between said web browser and the heterogeneous wireless network and an information gateway interposed between the heterogeneous wireless network and said web server. In Wu, the proxy in not interposed between the user device having an installed web browser and said heterogeneous wireless network. Moreover, as noted above, the "proxy" in Wu is not the equivalent of the claimed proxy and does not perform the same function for the same purpose as the Applicants' proxy. The applicability of the other references cited by the Examiner is rendered moot because the claimed architecture is not found in Wu or in Wu and any combination of the other cited references. Therefore, it is respectfully submitted that amended Claim 14 should be allowed in view of the art of record.

Claim 15 is dependent upon Claim 14 and claims said proxy includes means for determining that said user device is in an area of overlap by different networks within said environment and means for handing off said user device from a first network to a second network. Claim 17 is dependent upon Claim 15 and claims said second network operates at a higher bandwidth of said first network.

According to the Office Action, the features of Claim 15 are similar to the features of Claim 1. The comments made above with regard to Claim 1 generally apply to Claim 15.

In Gao a system and method are disclosed to support vertical handover between heterogeneous networks. To accommodate handover, an access router contacts a gateway specializing in supporting QOS during the handover. Paths with different QOS properties are configured among peer handover gateways. Thereafter, the gateway determines the corresponding destination handover gateway and chooses the path most suitable for the current handover requirements of applications. [Page 2, para. 0012] Page 5, para. 0049 reads that "The frameworks can support varying handover requirements in terms of delay, loss and bandwidth by choosing an MPLS path."

In contrast, Claim 17, which is dependent upon Claim15, which, in turn, is dependent upon Claim 14 claims, inter alia, an architecture comprising a proxy interposed between said web server and said heterogeneous wireless network, said proxy includes means for determining that said user device is in an area of overlap by different networks within said environment and means for handing off said user device from a first network to a second network, wherein said second network operates at a higher bandwidth than said first network. Claim 17 claims a preemptive handoff as described above. In Gao a predetermined path is found which meets the requirements to maintain QOS. The path is selected by the network and not a user device. In Gao there is no

means for determining that the user device is in an overlap area nor is there disclosed any means for handing off the user device from a first network to a second network operating at a higher bandwidth. That is, Gao fails to teach or suggest the concept of a preemptive handoff. Wu fails to disclose a proxy as claimed by Applicants.

The references, neither singly nor in any combination teach or even suggest a web browser side proxy and means for determining that the user device is in an area of overlap and means for handing off the user device from a first network to a second network wherein the second network operates at a higher bandwidth than the first network as claimed in Claim 17. Therefore, it is respectfully suggested that Claim 17 should be deemed allowable over the art of record.

Claims 2, 9 and 16 stand rejected under 35 U.S.C. 013(a) as being unpatentable over the references applied to Claim 1 and further in view of Dilman et al (Dilman) (US2002/0138599 A1).

In the system architecture of the invention, a network sensor layer at the mobile host provides network-awareness capability and a means to inform the HTTP session layer of a change of network conditions. The ability to timely discern changes in network conditions and know the root cause of such changes is a necessary feature in achieving a network-awareness capability. The changes of network conditions are random and detection of such changes is time dependent and event dependent. Detection of changes

can be accomplished by a number of different mechanisms and means, including basic application-layer mechanisms for detecting changes of network conditions; e.g. event-driven schemes and polling-based schemes. These two schemes are complementary and may be used in parallel but serve distinctly different roles in detecting various types of network failures.

An event-driven scheme is used to capture various network events during the course of an ongoing HTTP session. The present invention takes advantage of the exception handling mechanism and return status to capture various run-time network failures and to identify the root cause of such failures.

A polling-based scheme is used to collect the overall network conditions via a periodic polling of the network interfaces. This is particularly useful for detecting changes of network conditions involving multiple network interfaces.

Applicants' event-driven and polling mechanisms are performed locally and in a fully distributed fashion which are proposed to support network environment awareness. Applicants' event-driven and polling techniques are performed autonomously while the Dilman method requires a central server (SNMP manager) to trigger events and initiate polling of nodes in the network.

Dilman is cited for teaching network monitoring means/techniques that combine both event driven and polling schemes. The comments regarding the rejection to Claims 1, 8 and 14 are repeated. Dilman describes a method of monitoring network traffic in order to minimize network traffic by using a combination of aperiodic polling and asynchronous event reporting. The technique proposed by Dilman et al teaches how to optimally mix the SNMP trap and SNMP polling in order to minimize traffic for monitoring network elements. The main idea behind the technique is that it uses local nodes to monitor their own resources locally via SNMP-based polling. When any of nodes exceeds its prescribed budget (threshold), the node triggers an alarm message and sends the alarm message to a central network manager. Upon receipt of the alarm message, the central network manager will issue a global poll of all of the nodes in the network [page 1, para.0009]. In order to achieve this goal, it is assumed that all nodes in the network should be under the same administrator domain, and thus can be managed by the central monitoring network manager. The technique is restricted to a single network operator and is not applicable to a heterogeneous network environment since nodes in different networks can not communicate with each other.

In summary, the event-driven and polling mechanisms used in the claimed invention are performed locally and in a fully distributed fashion, which are proposed to support network environment awareness. The claimed architecture is a different system architecture from the one in Dilman. For example, Applicants' event-driven and polling methods are performed autonomously, while the method proposed by Dilman et al

requires a central server (SNMP manger) to trigger events and initiate polling of the nodes in the network.

Therefore, it is respectfully submitted that Claims 2, 9 and 16 should be deemed allowable over the art of record, including Dilman.

Claims 4, 5, 11, 18, 19 and 20 stand rejected under 35 U.S.C. 103(a) as being unpatentable over the references applied to the claims above, and further in view of Millard et al (Millard) (US 2003/0093341 A1).

Millard's approach is to use an edge gateway server to track traffic statistics on a per packet basis [see, abstract, page 1, para. 0003-0008], with the goal of enabling variable price billing [see, page 2, para. 0009]. This approach is fundamentally different from that of the Applicants in both system architecture and functionality.

In Applicants' claims, the counting the number of bytes received for each session is performed by the proxy, rather than by an edge gateway server and in the case of network handoff, a proper handshaking between the proxy (means to track) and the information gateway is performed to ensure that the partially downloaded documents (affected HTTP sessions) during network handoff can resume file loading where the loading was stopped.

In the present invention counting the number of bytes is performed at much finer granularity than Millard's method (aggregated basis). From the viewpoint of system architecture, counting the number of bytes is performed by the proxy on the client-side, rather than on the edge gateway server. In addition, counting the number of bytes received by each session is for the purpose of improving the efficiency of failure recovery and minimize the negative effects induced by network handoff. Technically speaking, failure recovery is a much more difficult problem than price billing.

With regard to claim 20, the feature in Millard that prevents disconnection during handoff is based on the assumption that there is a single provider of wireless services, including wireless cellular networks such as CDMA and geographically dispersed local wireless networks. In such a "hypothetical" case, theoretically, mobile IP technology could be a viable means for supporting un-interrupted service during network handoff. This is a network operator dependent approach. In addition, Millard only tracks traffic for successful transmissions. "Upon receiving the packet, a network processor in the edge gateway may create a copy of the received packet and transmit it to what is commonly referred to herein as a network processor subsystem within the edge gateway. The network processor subsystem may extract the packet header from the received packet and generate a key based on the extracted packet header." [page 1, para. 0008]

A network operator dependent approach is not applicable to the situation where cross-operator network handoff is involved. Diversity of cellular networks, plus

magnitude of ownership of local wireless networks, poses an insurmountable obstacle to the application of mobile IP technology in the diversity of network environments. In addition, the application of mobile IP is questionable for TCP sessions because long delay of network handoff could cause TCP session timeout, which also, in turn, results in interrupted communication.

It should be pointed out that interruption of communication during handoff is inevitable because existing applications are network oblivious. As a result, vertical network handoff will change its point of attachment, meaning that its IP address is changed, as a result, ongoing communication will be broken. For example, the point of attachment is changed from the Verizon CDMA network to the Telcordia Wi-Fi network, you can observe that the active IP address is changed. As a result, connections established from the CDMA network are broken. The lack of interruption during network should be interpreted in its virtual context.

The present invention provides for the minimization of the negative impact of network handoff by tracking an ongoing session with the user device (Claims 4, 5, and 11) or with a client-side proxy (Claims 18, 19 or 20). In addition, Claim 20 claims "said proxy and said information gateway communicate information from said tracking means so that upon handoff from said first network to said second network, file loading can begin where file loading was stopped because of said handoff."

Millard fails to teach or even suggest client-side counting of the number of bytes in a session. Therefore, it is respectfully submitted that claims 4, 5, 11, 18, 19, and 20 should be deemed allowable over the art of record.

Claims 6 and 12 stand rejected under 35 U.S.C. 103(a) as being unpatentable over the references applied to the claims above, and further in view of Lemon et al (Lemon) (US 2002/0156881 A1).

Lemon is mainly concerned with monitoring HTTP transactions between a server and a client, focusing on the two aspects of: (1) collecting the HTTP request information from clients which is similar to Web logging; and (2) collecting the HTTP responses sent by the server to the client [abstract, page 3, para. 0050-0052]. Lemon monitors HTTP transactions by capturing both HTTP requests and HTTP responses on the Web server side.

Lemon's method is different from the claimed invention in terms of architecture and functionality. Lemon's data collector component is designed to keep track of HTTP transactions, that is, HTTP responses and HTTP requests. Contrariwise, Claim 6 claims that the proxy tracks HTTP sessions, rather than HTTP transactions and Claim 12 claims establishing a HTTP session as a step in a method of handing off a user device from a first network to a second network.

Therefore, it is respectfully submitted that Claims 6 and 12 should be deemed allowable over the art of record including Lemon.

Claims 7 and 13 stand rejected under 35 U.S.C. 103(a) as being unpatentable over the references applied to the claims above, and further in view of Capriotti et al (Capriotti) (US 6,748,056)

Capriotti discloses a method to address the coordination between a telephony session and an email session in a universal messaging system. The coordination between a telephony session and an email session is as follows: start with a telephony session, which in turn initiates an email session using the subscriber's account on the mail messaging system. The email session loads the email messages, performs text-to-voice translation, and sends the translated audio to the telephone session. Such a coordination between a telephony session and an email session allows the subscriber to use a phone to retrieve an email message.

In contrast, Claims 7 and 13 claims SMTP, POP3, and IMAP or a streaming session in a heterogeneous wireless environment for network handoff and failure recovery, rather than coordination between different messaging systems. There is an absence of any motivation to combine the Capriotti messaging system (1) in a method of handing off a user device from a first network to a second network, or (2) with a proxy

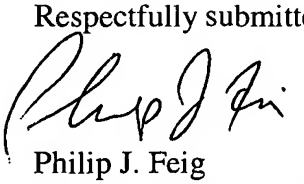
for use with a user device operating in a heterogeneous wireless network environment, as claimed in Claims 7 and 13.

Therefore, it is respectfully submitted that Claims 7 and 13 should be deemed allowable over the art of record including Capriotti.

Reexamination, reconsideration and favorable allowance of Claims 1 to 20 in the application are respectfully solicited.

The Patent and Trademark Office is hereby authorized to charge Deposit Account No. 02-1822 the fee due under 37 CFR 1.17(a) of $120.00 for a one month extension of the time to reply to the Office Action.

Respectfully submitted,



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